IN THE SPECIFICATION:

Please replace the paragraph beginning at page 3, line 15 with the following rewritten paragraph:

--Various solutions to the problems of shaping glass tubes are disclosed in Applicants' co-pending ~~applications titled "Apparatus and Method For Shaping Glass Tubes" (Application~~ Application Serial No. 09/497,044, filed February 2, ~~2002) and "Apparatus and Methods For Shaping Glass Tubes With Molds" (Application Serial No. 09/497,043, filed February 2, 2000)~~ 2000, and U.S. Patent No. 6,536,239. However, in the molding operation disclosed in those applications, the exhaust tube must be heated to a very high temperature by means of a torch until the end region of the tube becomes soft. Then, the torch is removed and the mold pieces are applied to the end region of the tube. During this time the torch is removed and until the mold pieces are applied, the end region of the tube undergoes some cooling whereby, when the mold is applied, the tube may not have the desired softness. Overheating the tube end to compensate for the ensuing cooling may result in the tube end deforming in an undesired manner. The prior art schemes also require that the torch be moved via a motor or other control means under relatively high temperature conditions.--

Please replace the paragraph beginning at page 10, line 17, with the following rewritten paragraph:

--The end section of tube 12, beginning at point 125, and the opening (mouth) 66 of tube 12 are shaped to accommodate tube 10. Thus, as shown in Figs. 2A and 2B, the rim region 17 of exhaust tube 12, extending between ~~cross line 13 and end point~~ shoulder 19 and end 14, is specially shaped to accomplish several functions. First, beginning at ~~line 13~~ shoulder 19,

the inner diameter of tube 12 is now increased for a length "L2", until the end ~~edge~~ 14 of tube 12. The inner diameter of tube 12 is increased from a value of d2=d1, at ~~point 13~~ shoulder 19, to a value which is just a little greater than $d_{o1}$, at end ~~point~~ 14; where d1 and $d_{o1}$ are, respectively, the inner and outer diameters of starter tube 10. The increase in the dimension of the opening of tube 12, between points 13 and 14, is just enough to ensure that tube 10 can be "snuggly" inserted into tube 12 and to ensure that both tubes, when mated, have a common center line.--

Please replace the paragraph beginning at page 11, line 6, with the following rewritten paragraph:

--Note that decreasing the inner diameter of tube 12 from point 125 to ~~point 13~~ shoulder 19 and then increasing the inner diameter of tube 12 from ~~point 13~~ shoulder 19 until the end ~~edge 14~~, produces a "stop" within tube 12 which prevents the starter tube from being inserted into tube 12 past ~~"cross line" or point 13. As shown in Figs. 2, 2A and 2B, along line 13, within tube 12, there is formed an L-shaped ledge (and/or lip), 19, at mating surface 13 so that the starter tube 10 and the exhaust tube 12 can be nested and joined with each other, while preventing tube 10 from penetrating past surface 13 into tube 12~~ shoulder 19. As shown in the figures, between points 13 and 14, the outer wall of exhaust tube 12 includes ~~side extensions 21a, 21b which extend beyond ledge~~ an extension 21 which extends beyond shoulder 19 for a distance "L2". In the region ~~between extensions 21a, 21b~~ of extension 21, the inner diameter of tube 12 is just a little greater than the outer diameter of tube 10. This ensures that tube 10 can be inserted ~~"snuggly"~~ snugly within the opening of tube 12 for a distance of approximately L2. As further discussed below (regarding Fig. 6) when heat is supplied to tube 12 after the insertion therein of tube 10, the ~~side extensions 21a, 21b,~~ extension 21 of tube 12 may "collapse" about

tube 10, thereby fusing/joining tubes 10 and 12 to form a unitary combined component, referred to herein as a "preform". Thus, the cross section of the exhaust tube profile is also shaped so as to provide a sufficient amount of "flowable" material within extension ~~21a, 21b~~ 21 which fuses into a smooth walled inner diameter joint upon completion of the heating (joining and/or fusing) process. That is, the inner walls at the interface of the starter and exhaust tubes are smooth, after the two have been joined or fused.--

Please replace the paragraph beginning at page 13, line 11, with the following rewritten paragraph:

--The shapes and functions of molds embodying the invention and their application to exhaust tubes are shown in Figs. 3A, 3B, 4A, 4B, 4C and 4D. In Fig. 3A there is shown a simplified cross sectional diagram of a 3-piece mold which is about to be applied to a hollow cylindrical tube 12. In Figs. 3B, 4A, 4B and 4C, the tube is shown as shaped by the mold. The 3-piece mold includes elongated side sections 22a, 22b and an end plug, or cap, 23. The side sections 22a and 22b are applied along an end section 121 of tube 12, extending from a point 127, past the bending point 125, the stop line 13 and past the end 14 of tube 12. The side sections impart a smooth taper to the end section of the tube 12 and reduce its inner diameter gradually such that at a point 13, the inner diameter of tube 12 matches that of starter tube 10, intended to be mated with tube 12. The resulting end section of tube 12 may be generally characterized as ~~an oblate cone like~~ a substantially conical section. The end plug 23 includes a solid cylindrical stub 230 and an end cap section 232. The solid cylindrical stub section 230 is inserted into the orifice 66 at the selected end of hollow cylindrical tube 12 to shape the rim of the tube and to prevent the inner diameter of the tube 12 from decreasing below a predetermined

value (e.g., approximately d1 of the mating starter tube). The solid cylindrical section 230 of plug 23 also has two sections (231, 233) of different size, whereby a step (see Figs. 4A, 4B and 4D) is formed between the two sections. The step causes ~~a ledge (lip or groove)~~ the shoulder 19 to be produced within the inner surface of tube 12 ~~(at point 13)~~ while the portion of the tube squeezed between the inner surfaces of mold pieces 22a, 22b and the outer surface of the cylindrical stub ~~230~~ section 231 results in ~~extensions 20, 20b~~ extension 21 between lines 13 and 14, as shown for section 17 in Figs. 2, 2A and 2B. The end cap ~~section~~ 232 functions to effectively seal the end 14 of tube 12. The application of the ~~3~~ mold pieces, 22a, 22b and 23, to a selected end of tube 12, after it has been rendered malleable, causes tube 12 to assume the form shown in Figs. ~~1, 2, and 3B~~ 2, 2A, and 2B.--

Please replace the paragraph beginning at page 16, line 11, with the following rewritten paragraph:

--From point 125 until the edge 123 (corresponding to ~~edge 13~~ shoulder 19 on tube 12), the inner surfaces of the side pieces 22a, 22b, taper down, conically, while leaving an opening 66a at the end of the mold (which also forms opening 66 in tube 12). At the point 123 on the inner surfaces of the mold (corresponding to ~~edge 13~~ shoulder 19 of tube 12), the two side pieces, when joined, leave an opening 66a. The opening 66a needs to be sufficiently large to ensure that the inner diameter of the "shrunken" exhaust tube at ~~point 13~~ shoulder 19 is approximately equal to the inner diameter of starter tube 10 while the outer diameter of tube 12 between lines 13 and 14 is just a little larger than the outer diameter of starter tube 10. This enables the starter tube to be inserted ~~"snuggly"~~ snugly into the opening of tube 12.--

Please replace the paragraph beginning at page 16, line 22, with the following rewritten paragraph:

--The two elongated side pieces 22a, 22b are complementary to each other and are intended to be joined along walls, 41a, 41b, so as to encircle tube 12 along its length, near its end 14 (the right hand side in the figures). The inner surfaces of the two side pieces 22a, 22b extend from a ~~first, or front,~~ front end 44 to a ~~second, or back,~~ back end 54. The inner surfaces 26a, 26b, of the side molds define two general regions. The ~~first (or front)~~ front region is ~~an arcuate~~ a cavity 25 which extends from the front end 44 to a ridge 46 for receiving the tube 12 and imparting a ~~conic~~ conical shape to the end section 121 of tube 12. Each front region of the side pieces 22a, 22b has two sections. The ~~front region~~ first section extends from the first end 44 to a point 125a and the ~~rear (second) region~~ second section extends from point 125a to the ridge 46. Within the ~~front region~~ first section the inner surfaces of the side pieces are cylindrical. Within the second ~~region~~ section (from point 125a to ridge 46) the cavity narrows forming a tapered segment 129a. Ridge 46 is bordered by a smooth ~~annular~~ cylindrical ring 52. The ~~second (or back)~~ back region of the inner surfaces 26a, 26b of the molds is for receiving the solid cylindrical stub 230 of end plug 23 which controls the diameter of the end edge of tube 12 and shapes the rim and opening of tube 12. The second region of the side pieces extends from the back end of ridge 46 which is defined by a back wall 58 ~~(facing leftward)~~, which is a smooth annular wall, A ledge 56 extends from back wall 58 to the back end 54 of the mold. When the two elongated side mold pieces 22a, 22b are joined together as shown in ~~Fig, 3B~~ Fig. 3B, a circular opening 66a is formed around ~~annular~~ ring 52 corresponding to opening ~~in the rear of~~ 66 of exhaust tube 12.--

Please replace the paragraph beginning at page 18, line 4, with the following rewritten paragraph:

--The end plug ~~(or cap)~~ 23 may be better described with reference to the simplified cross sectional diagram of Fig. 4D. Plug 23 includes an end cap section 232 from which extends (leftwards in the figures) a solid cylindrical stub 230. Solid cylindrical stub 230 has a first section 231 of diameter $d_o1$ and length L2 extending from the "inner" surface 234 of end cap section 232. The stub 230 has a second section 233 extending from the first section 231. The second section 233 is of diameter d1 and its length is not critical, so long as it is long enough to ensure that the inner diameter of tube 12 at ~~point 13~~ shoulder 19 is established. Thus, end plug 23 ensures that the opening 66 at ~~point 13~~ shoulder 19 of tube 12 is approximately equal to a first value (e.g., d1) and that the inner diameter of the tube along length L2, between point 13 and end edge 14, is just greater than a second value (e.g., $d_{o1}$) to form a ledge or lip a distance L2 from the end 14 of tube 12 and to enable a starter tube to nest within the opening of tube 12 and abut against ~~ledge~~ shoulder 19. In a particular embodiment, the values of d1 and d2 were equal to 22 millimeters, $d_o1$ was equal to 28 millimeters, $d_o2$ was equal to 29 millimeters, L1 was equal to 25 millimeters and L2 was equal to 5 millimeters and dt2 was approximately 55 millimeters.--

Please replace the paragraph beginning at page 18, line 21, with the following rewritten paragraph:

--End plug ~~(or cap)~~ 23 may be held by a rod 34, or be part of the rod 34 (see Figs. 3A, 3B). Plug 23 includes a solid cylindrical stub 230 extending from the ~~back cylindrical portion~~ end cap 232 of plug 23. A portion 232a (see Fig. 4C) of back portion 232 is designed to fit within the rear opening formed by the two side pieces, 22a, 22b. The "inner" surface 234 of

portion 232a is intended to fit against the wall 58 while resting on ledge 56. The solid cylindrical stub 230 extends through the ~~annular~~ ring 52 and can be inserted within the rear hollow neck of tube 12, to control the inner and outer diameters of tube 12 and the shape of the tube opening in the end region between points 13 and 14. The solid cylindrical stub 230, includes a ~~step~~ section 231 extending for a length L2 along the stub from the back plane 234. The ~~step~~ section 231 causes the rim of tube 12 to have a desired shape such as the one shown in Figs. 2, 2A and 2B. In the figures, a step ~~31~~ is shown~~,~~ between sections 231 and 233. However, a curve and/or other shaping structure or profile matching structure may be used.--

Please replace the paragraph beginning at page 19, line 22, with the following rewritten paragraph:

--Referring to Fig. 5, there is shown an apparatus for semi-automatically, or automatically, applying the mold pieces to a hollow cylindrical glass tube 12 for shaping a selected end 121 of the tube. Tube 12 is firmly positioned within a central opening 64 of a rotatable chuck 62 of a horizontally mounted controlled speed lathe 60. The lathe 60 supports tube 12 and ensures that tube 12 is rotated at a controlled speed. A heat source 16 is positioned such that the selected end portion, 121, of tube 12 is heated to a temperature ~~of, for example, approximately 2,100 degrees centigrade,~~ which causes the end of the tube to become soft and malleable. The heat source 16 may be an oxygen-hydrogen torch, but any other suitable heat source may be used. The temperature of the heat source applied to the tube can be measured by a pyrometer 80 having an output which can be coupled to control circuitry (see Fig. 9) for controlling the heat supplied to the tube end, 121. The output of pyrometer 80 may also be used to control the application and retraction of the heat source, 16, and the application and retraction

of the mold pieces applied to the tail end of the tube 12. The heat source 16 may be moved back and forth via motor 65 which may be controlled by an output from pyrometer 80, or by other means such as an optical sensor (e.g., photosensor 87), or manually, and/or by any other independent or related means.--

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claims 1-13 (Canceled)

14. (Twice Amended) A multi-piece mold as claimed in Claim 24, wherein ~~the glass tube is a hollow cylindrical glass tube; and wherein~~ the heat source includes distribution channels through which gas may be distributed with gas jets emanating along the inner surface of at least one of the pieces.

Claim 15 (Canceled)

16. (Twice Amended) A multi-piece mold as claimed in Claim 14, wherein the distribution channels within the at least one piece ~~is~~ are coupled to tubing coupling the distribution channels to a gas fitting to which a source of gas may be attached.

17. (Previously Amended) A multi-piece mold as claimed in Claim 14, wherein ejection of gas occurs at several points along the inner surface of at least one piece.

18. (Previously Amended) A multi-piece mold as claimed in Claim 14, wherein at least one of said pieces includes ventilation channels extending between its inner and outer surfaces to enable air and gases trapped between outer walls of the tube and the inner surfaces of the mold to escape.

Claims 19-22 (Canceled)

23. (Original) A multi-piece mold as claimed in Claim 14, wherein the pieces of the mold are formed of material capable of operating at temperatures in excess of the melting point of glass and without contaminating the glass.

24. (Thrice Amended) A multi-piece mold for shaping an end portion of a glass tube having an opening, said mold comprising:

two ~~elongated sleeve-like~~ side pieces which, when joined, ~~encircle a~~ form a cavity which can enclose an end portion of ~~the~~ a tube for shaping the tube; and

an end plug ~~piece~~ including an end cap and a cylindrical stub ~~positioned at a free end of said end plug and~~ having a diameter less than a diameter of said end ~~plug~~ cap, said stub being configured for insertion into the opening of the tube for allowing rotational movement of the tube about said cylindrical stub for controlling the inner diameter of the tube; ~~and~~

wherein at least one of said side pieces ~~of the mold~~ includes a heat source, formed within the one piece, for heating the tube to render it malleable.

25. (Original) A multi-piece mold as claimed in claim 24 wherein the heat source includes heating gas distribution channels, formed within the one piece of said multi-piece mold, with said distribution channels formed to eject gas along an inner surface of said one piece of said multi-piece mold.

26. (Original) A multi-piece mold as claimed in Claim 24 wherein said tube is an exhaust tube shaped to mate with a starter tube, such that the exhaust and starter tubes can be joined easily at their mating ends.

Claims 27-30 (Canceled)

31. (Thrice Amended) Apparatus for shaping ~~a selected~~ an end portion of a glass tube having an opening, said apparatus comprising:

~~a support~~ means for holding the tube and for imparting rotational motion to the tube;

a multi-piece mold ~~having one piece in which is formed a heat distribution source, said mold~~ having two side pieces for imparting ~~an oblate cone-like~~ a substantially conical shape to ~~a~~

~~selected~~ an end portion of the tube while leaving an opening for accessing the opening of the tube, ~~at its selected end~~ one of said side pieces having a heat distribution source formed therein, and wherein said mold includes an end plug ~~and~~ having an end cap and a cylindrical stub ~~positioned at a free end of said end plug and~~ having a diameter less than a diameter of said end ~~plug~~ cap, said stub being configured for insertion in the opening of the tube for allowing rotational movement of the tube about the end plug for controlling the inner diameter of the tube at its end surface; and

an actuatable mechanical holding means for holding the multi piece mold, including means for holding the one piece in which is formed a heat distribution source, in proximity to the selected portion of the tube for heating the selected tube portion to render it malleable, and for selectively applying the mold pieces to the tube for shaping the selected portion of the tube.

32. (Original) An apparatus as claimed in Claim 31, wherein the apparatus includes temperature sensing means for sensing the temperature of the selected portion of the tube; and wherein the apparatus includes means responsive to a signal from the temperature sensing means for applying the mold pieces to the selected portion of the tube.

Claim 33 (Canceled)

34. (Twice Amended) An apparatus as claimed in Claim 31, ~~wherein~~ further comprising means for supplying positive air pressure ~~is supplied~~ to the tube ~~at its unselected end,~~ while the ~~selected~~ end portion of the tube is being heated and molded, to cause the tube to conform to the shape being imparted by the mold.

Claim 35 (Canceled)

36. (Original) An apparatus as claimed in Claim 31 wherein the apparatus includes a temperature sensor for sensing the temperature of a selected portion of the tube for producing an

actuating signal coupled to the actuatable mechanical holding means when the temperature of the selected end portion is such that the tube is malleable.

37. (Original) The apparatus as claimed in Claim 36 wherein the heat distribution source functions as a torch and wherein said temperature sensor functions to control the intensity of the torch.

38. (Withdrawn) A method for shaping a selected end of a glass tube comprising the steps of:

positioning the tube within a support means;

heating the selected end of the tube with one piece of a multi-piece mold, where the one piece contains a heat source, until the selected end of the tube becomes malleable; and

applying the multi-piece mold to the selected end of the tube when the selected end becomes malleable for shaping the selected end the tube.

39. (Withdrawn) A method as claimed in Claim 38 wherein the heating of the selected end of the tube is controlled by a temperature sensor to control application of heat via one piece of the mold.

40. (Withdrawn) A method as claimed in Claim 39 further including the step of supplying a signal from a temperature sensor to a microcontroller coupled to the heat source to control the amount of heat (gas) applied to the tube.

41. (Withdrawn) A method as claimed in claim 39 further including the step of supplying a signal from the temperature sensor to a microcontroller to control application of heat to the tube and the application of the multi-piece mold to the tube.

42. (Withdrawn) A method as claimed in Claim 38 further including the step of applying positive air pressure to the unselected end of the glass tube.

43. (Withdrawn) A method as claimed in Claim 38 further including the step of rotating the tube in a controllable manner, while the tube is being heated.

44. (Withdrawn) A method as claimed in Claim 38 further including the step of biasing the heated tube end to conform to the multi-piece mold; and removing the mold from the conformed tube after a predetermined time period.

45. (Withdrawn) A method for shaping a selected end of a hollow cylindrical tube, comprising the steps of:

positioning the tube within a support means;

placing a mold containing a heat source in close proximity to the selected end of the tube until the selected end segment of the tube becomes malleable; and

applying the mold to the selected end of the tube when the tube becomes malleable for shaping the tube to conform to the mold.

46. (Withdrawn) A method as claimed in claim 45 including the step of sensing the condition of the tube section being heated.

47. (Withdrawn) A method as claimed in Claim 46 including a control system responsive to sensing the condition of the tube section being heated for then applying all the mold pieces to the tube.

48. (New) A multi-piece mold for shaping an end portion of a glass tube to form an exhaust tube which is fitted to a starter tube of an optical fiber preform, said multi-piece mold comprising:

two complementary side pieces having inner surfaces which, when joined, form a cavity which can enclose an end portion of a glass tube for shaping the tube, said cavity having a first cylindrical section, a second cylindrical section, and a conical section which tapers from said first cylindrical section down to said second cylindrical section, and

an end plug comprising an end cap and a cylindrical stub, said cylindrical stub having a first section with a first diameter which is smaller than the diameter of said end cap and a second section with a second diameter which is smaller than said first diameter, said cylindrical stub being receivable in said second cylindrical section of said cavity to shape an inside surface of said end portion of the glass tube so that said end portion has a first region with said first diameter, a second region with said second smaller diameter, and a shoulder separating said first and second end regions, whereby,

said end portion of said tube can snugly receive an end of a starter tube having an outside diameter which is slightly smaller than said first diameter and an inside diameter which is substantially the same as said second diameter to form a preform having an exhaust tube which

is centered with respect to said starter tube and having an inside surface with a smooth transition between said exhaust tube and said starter tube.

## REMARKS

The specification has been amended for clarity and consistency. More particularly, since the numeral 13 is initially used for the end 13 of starter tube 10, it is no longer used to describe the shoulder 19 of the exhaust tube 12. Since the extension 21 is a single circular feature, it is no longer identified as a pair of extensions 21a and 21b.

Independent claims 24 and 31 have been amended for internal consistency as well as consistency with language of the specification. Dependent claims 14, 16 and 34 have been amended for clarity.

Newly submitted independent claim 48 recites a multi-piece mold which is profiled to form the self-centering structure for the starter tube in the end of the exhaust tube.

Claims 14, 16-18, 23-26, 31-32, 34, and 36-37 (all pending claims) stand rejected under 35 U.S.C. §103 as unpatentable over U.S. Patent No. 2,107,979 (Dichter) in view of U.S. Patent No. 4,846,746 (Prost). To the extent that this rejection would be applied to claims as presently amended, it is traversed for the reasons following.

Dichter discloses a plunger 35 which is received in the open end of a vial 10, and rollers 30, 31 which are rolled against the outside of the vial to form threads 20 for engaging a cap. There is no suggestion of a multi-piece mold including a pair of side pieces which, when joined, form a cavity which can enclose an end portion of a tube for shaping the tube. The rollers 30, 31, do not form a cavity. Heat for shaping the vial 10 is provided by burners 16; the glass must be softened by heat from the burners 16 before the rollers 30, 31 bear against the glass to form the threads. The vial is then driven to rotate by a rubber roller 15 so that the rollers 30, 31 form the threads.

Prost discloses a bottom mold 1 having an axial opening 2 which receives glass tubes 9 and 10; heat is applied by a burner 19 which is located outside of the mold as shown in

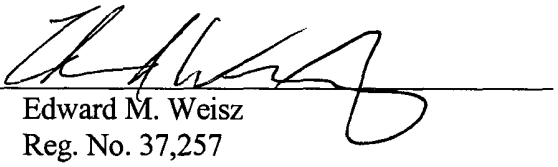
Figure 3. The examiner's conclusion that the glass is heated by a heat source in the mold is incorrect. Even if this were the case, there is no suggestion of two side pieces which form a cavity enclosing an end portion of a tube.

In sum, neither of the references discloses the basic features of applicants' claims, in particular the heat source formed within one of the side pieces. Likewise none of the art of record suggests the multi-piece mold recited in new independent claim 48.

The claims as amended being definite and patentable over the art of record, withdrawal of the rejections and early allowance are solicited.

Respectfully submitted,

COHEN, PONTANI, LIEBERMAN & PAVANE

By 

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